Aug. 28, 1934. A. J. LAIRD 1,971,985

RAZOR

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Fig. 1.

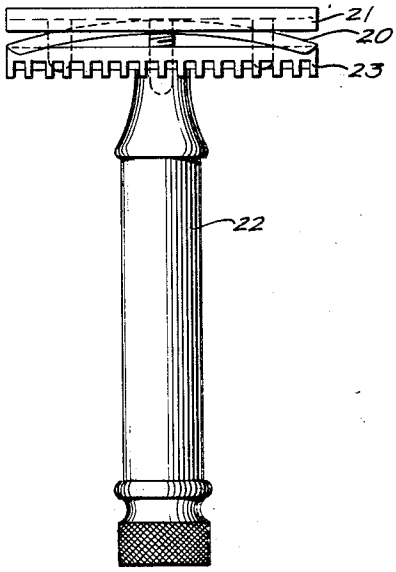


Fig. 2.

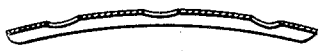


Fig. 3.



Fig. 4.

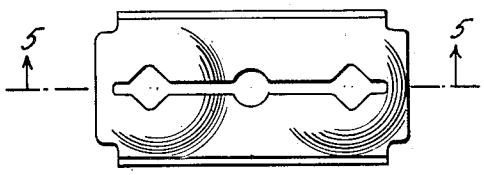


Fig. 5.



Fig. 6.

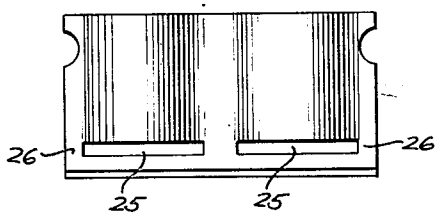


Fig. 7.



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Fig. 8.

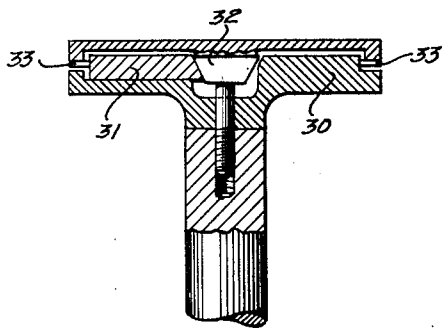


Fig. 10.

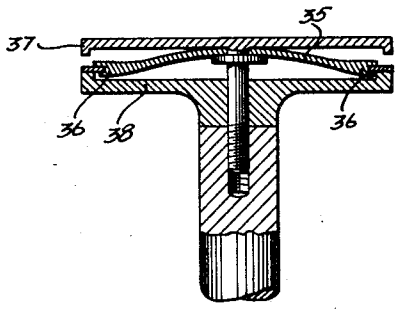


Fig. 9.

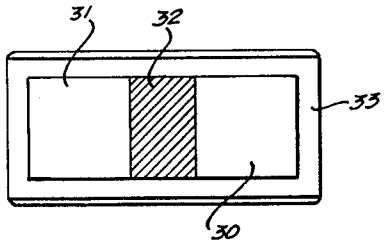
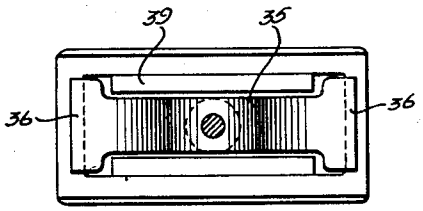


Fig. 11.



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UNITED STATES PATENT OFFICE

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RAZOR

Archibald Jarvie Laird, Glasgow, Scotland

Application March 25, 1931, Serial No. 525,100
In Great Britain November 18, 1930

20 Claims. (Cl. 30—12)

This invention relates to razors and razor blades. More particularly, the invention relates to razors and razor blades which are adapted to concentrate longitudinal tension along their cutting edges sufficient to stiffen and hold taut the flexible edge of said blade.

Prior to my invention, finer cutting edges had been sought by use of harder metals and improved methods of heat treatment. It is a known fact that brittleness, stiffness and rigidity are not primary qualities inherent in a substance, but on the contrary depend upon shape and form, i. e., the massing of the substance. Thus, even glass, one of the most rigid and brittle of materials, becomes as flexible as silk or tissue paper when it is blown or drawn into fine threads or thin films. Hardened or tempered steel is usually considered brittle and rigid, but when reduced to the extreme thinness required for the cutting edge of a razor it also loses the above properties which are generally considered as distinctive of tempered or hardened steel.

By virtue of its thinness alone, the cutting edge of a razor has acquired qualities of flexibility not possessed by thicker sections of the blade, and has lost qualities of brittleness and stiffness pertaining to the thicker sections. My invention is based on the recognition of the fact that, in extremely thin sections, most materials, which otherwise would be brittle and stiff, may become flexible. Tightening the edge of a flexible sheet of paper, or even a blade of grass, will convert it into a keen cutting edge by giving it artificial stability; so will a blade made or treated by my invention become keener and more efficient by having its flexible edge drawn taut, with all slackness removed, thus preventing edge distortion when in use.

Thus, accepting the properties of thin sections and recognizing that no metal, however hard and stiff, can by its mere hardness or stiffness make a stable razor edge, I have abandoned attempts to improve the metal and have turned to a treatment of the edge as a thin section. In my invention, end tension replaces the quality of stiffness which heretofore has been sought futilely.

My invention, then, consists broadly in the combination of a blade having a razor edge and means for stretching the metal of the edge sufficiently to hold it taut, and my invention also contemplates forming the blade so as to cooperate in tensioning or removing slackness from the cutting edge.

I have shown in the accompanying drawings a few of the many ways in which the invention may find practical embodiment.

Fig. 1 shows in elevation a safety razor of a well known type having a blade made in accordance with my invention in place and ready to be drawn down so as to tension the cutting edge.

Fig. 2 is a longitudinal section taken through the center of the blade shown in Fig. 1.

Fig. 3 is a cross-section through the center of the same blade.

Fig. 4 shows in plan view a blade of another well known type.

Fig. 5 is a cross-section through the blade of Fig. 4.

Fig. 6 is a plan view of another type of blade made in accordance with my invention.

Fig. 7 is an edge view of the blade shown in Fig. 6.

Fig. 8 shows in central longitudinal section another form of blade and holder.

Fig. 9 shows a cross-section of the embodiment shown in Fig. 8, and Figs. 10 and 11 show respectively in vertical longitudinal section and in cross-section another type of holder and blade assembled.

Referring first to Figs. 1, 2 and 3, the blade 20 shown therein is dished, in this case being given a substantially spherical form. Thus, the cutting edges are shorter between any two parallel transverse planes than any other part of the surface, and as a result, when the top 21 of the head of the razor 22 is clamped down against the guard 23, the blade will be deformed to fit the cylindrical surfaces of the guard 23, and the top 21; and this deformation will result in the stretching of the metal adjacent the cutting edge, and consequently in tensioning the flexible extremity of the cutting edge. Thus, without requiring any change in the holder, nor in the blade, except for its buckling, a razor is provided with a keenness beyond any which has been attainable heretofore.

Instead of the form shown in Figs. 1, 2 and 3, many other forms may be given to the blade, which will accomplish the same result. Thus, in Figs. 4 and 5, the blade is shown as having shallow undulations, while in Figs. 6 and 7, the blade is shown with two cylindrical buckles.

In the form shown in Figs. 6 and 7, the shape of the buckle is made possible by virtue of the slots 25. It will be understood, of course, that the width of these slots is not essential, the important fact being that the buckled metal is severed from the metal adjacent to the edge. When a blade such as that shown in Figs. 6 and 7 is

clamped so as to flatten or compress the buckle, a longitudinal force is transmitted from the buckled metal to the metal adjacent the edge through the end portions 26, where the edge is joined to the body of the blade.

The use of such slots is, of course, not limited to the particular form shown in Figs. 6 and 7, and is possessed of advantage, even though the cylindrical buckling is not used. Likewise, the severance of the margin from the body of the blade may be less complete, as by means of shorter slots or cuts, or by a series of perforations, or, if the metal of the margin is sufficiently rigid, or is held by cooperating parts on the holder, the severance may be substantially complete from one end portion 26 to the other. The severance of the edge margin from the buckled portion may be made with or without the removal of any metal. Thus, in the type of blade shown in Figs. 6 and 7, it will often be more advantageous not to remove any metal, but merely to slit the metal.

It will be understood, of course, that the particular types of blades shown are not necessarily connected with a particular form of the invention illustrated thereby. I have merely shown these various forms, each on a different type of blade, to emphasize that the invention is applicable to many different types of blades, and it is equally true that the invention is applicable to each type of blade in many different forms. I have found that the best results are obtained, with all of the types of blades shown, when the buckling is in the form of shallow waves or undulations having their axes of propagation parallel to the cutting edge.

It will be observed in each of the above illustrations that the blade is initially formed with the edge shorter between transverse parallel planes than any other portion of the surface. In this manner, the invention may be made applicable without changing the type of holder. It is also possible, by use of a suitable blade holder, to exert a mechanical tension upon the margin of the blade adjacent the edge. Thus, for example, in Fig. 8 I have shown a cross-section through a holder designed to exert a stretching tension upon the edge margin of the blade and a blade in operative position designed for use therewith. In this case, the blade has its center cut away, leaving only a margin of steel adjacent each cutting edge and across the ends. The blade is positioned in the holder so that this opening fits over the blocks 30 and 31 of the holder, at least one of which is slidable lengthwise. The blocks 30 and 31 fit substantially accurately to the opening of the blade. The sliding of the block 31 to stretch the blade may be accomplished by any one of many mechanisms adapted for the purpose. In the present instance, a keystone block 32 is designed to be drawn between the anchor block 30 and the sliding block 31, so as to spread them and take up any gap between the ends of the blocks and the blade. The keystone block 32 is advantageously drawn down by means of a screw associated with the handle, so that the holder may be assembled in the same manner as with the two-edged blade holder in most common use. The blocks 30 and 31, and preferably also the keystone block 32, may be made of invar steel or other substances possessed of very low coefficient of expansion.

The blade, after it is assembled, may be dipped into hot water so as to cause the steel of the blade to expand. The invar steel of the blocks 30, 31 and 32 will, however, expand much less, both because the heat will reach it less, and because of its lower thermal expansion. The keystone block 32 is then drawn more tightly into position to take up the additional slack produced by this differential expansion and the razor is removed from the hot water and allowed to cool slightly. The cooling will tend to contract the metal of the blade, but since it is held by the blocks 30, 31 and 32, a longitudinal tension will be set up in the margin 33 adjacent the cutting edge of the blade.

Instead of the use of a differential expansion element such as the blocks 30, 31 and 32, other means for effecting longitudinal stretch of the blade may be used. Thus, a curved or waved leaf spring 35 may be used, its edges 36 engaging the blade at the ends of the central opening. This spring, when compressed, serves to stretch the blade in a longitudinal direction when it is compressed by the closing of the upper and lower parts 37 and 38 of the holder. Its action in this case is quite similar to the action of the buckled center portion made integral with the blade, as shown in Figs. 1 to 7. Instead of the spring 35, a toggle or other means for applying the stretching force to the blade may in some cases be used.

In the embodiments shown in Figs. 8 to 11, the blade consists of a narrow margin, and consequently is possessed of comparatively little resistance to a force applied against its edge. Ordinarily, it would be undesirable to have the blade yield during shaving, and accordingly such a blade should ordinarily be supported. Thus, in the embodiment shown in Fig. 8, the blocks 30 and 31 are fitted closely to the width of the opening in the blade, and thus form a support behind the blade, which permits of only a very slight yield, if any. In the embodiment shown in Figs. 10 and 11, abutments 39 have been provided on the lower member 38 of the holder and these abutments serve in the same manner to support the blade against yielding under the pressure encountered in shaving.

I am aware that prior to my invention it has been suggested to mount a blade in a holder and secure it by being fastened at its ends with tension or compression with a view to holding the blade operatively in the holder. In such cases, no advantage has been recognized nor achieved in the stretching of the margin of the blade adjacent the edge, and no effort has in any such case been made to localize the tension in the metal adjacent the edge. As a result, the support given to the edge metal by the metal forming the body of the blade has prevented the high degree of longitudinal tension upon the edge, which is characteristic of the present invention and necessary for fulfillment of my desired purpose.

It is desirable, in the practice of my invention, to choose a metal, or other substance, for the blade which combines with suitable hardness, toughness and other characteristics desirable for cutting blades, the quality of relatively high elasticity and low permanent elongation. In other words, the blade should be capable of stretching sufficiently to hold the cutting edge taut during use, and when released to resume its original shape and condition, without permanent deformation. Tempered steel, such as has been used in the highest grade razors, is such a metal, and I have found such high grade steel to be very desirable for use in my invention.

When steel is used, the blade is advantageously

formed and given the shape required to produce the longitudinal tension before the steel is hardened or tempered. I have also discovered that the blade is advantageously given its final honing while in the tensioned condition, since the tension serves, by holding the thin edge taut, to hold it more firmly against the stone, and thus to produce a more uniform edge.

The above description is, I believe, entirely accurate. Nevertheless, I recognize the possibility that I may be mistaken in my explanation of the improved results which are obtained by the tensioning. Obviously, the advantages of my invention are in no way dependent upon the correctness of any theory which I have formulated on this subject, and accordingly I do not intend to be bound to any theory or explanation set forth herein.

Although I have shown in the drawings and have described a number of embodiments of my invention, and have suggested various modifications thereof, I have not tried to set forth exhaustively all of the various forms and modifications of the invention which may be found desirable under varying circumstances. Many other forms and methods of embodying my invention will at once suggest themselves to those skilled in the art, and accordingly I do not intend to be limited to the particular forms and modifications shown and described above.

What I claim is:

1. A laminar razor blade of resilient metal of which a portion spaced from the cutting edge by only a narrow margin is buckled into waves relative to the cutting edge.

2. A laminar razor blade of resilient metal of which a portion spaced from the cutting edge by only a narrow margin is formed with shallow undulations which increase the distance along the surface of said portion between parallel transverse planes beyond the distance between said planes along the surface of the blade at its cutting edge.

3. A laminar razor blade of resilient metal of which a portion spaced from the cutting edge by only a narrow margin is buckled into transverse waves and said margin is at least partially severed from said buckled portion but is joined thereto near its ends.

4. A razor comprising a blade having its cutting edge and a thin supporting border immediately adjacent thereto made of resilient metal capable of substantial stretch within its elastic limit, said blade having a buckled portion engaging said border at least at its opposite ends, and a holder adapted to clamp the blade between substantially rigid supporting members so as to compress the buckled portion when the blade is clamped and thereby to stretch said border.

5. A laminar razor blade of resilient metal of which a portion separated from the cutting edge by only a narrow margin is buckled relatively to said edge, the margin being at least partially severed from the buckled portion but joined thereto near its ends.

6. A safety razor comprising, in combination, a pair of clamping members and a laminar blade clamped flatwise between said members and when clamped to conform to the adjacent faces of said members, said blade having at least one longitudinal cutting edge and having in its unclamped condition parts of its surface located on opposite sides of the surface presented by said blade when clamped.

7. A safety razor comprising, in combination, a backing member, a guard member and a laminar blade clamped flatwise between said members, said blade having at least one longitudinal cutting edge and having in its unclamped condition a non-planar surface adapted to be flattened on clamping said blade, longitudinal lines drawn on which surface at a distance from and parallel to said edge between parallel planes perpendicular to said edge are longer than said edge.

8. A safety razor comprising, in combination, a pair of clamping members and a laminar blade having at least one longitudinal cutting edge clamped flatwise between said members with only the cutting edge and an adjoining narrow margin exposed, the exposed portion of said blade being under longitudinal tension in excess of any tension in the unexposed portion of said blade.

9. A non-planar safety razor blade of laminar metal having a central opening and having at least one permanently rectilinear cutting edge and being deformable in directions to increase the length of surface strip portions of the blade parallel to and spaced from said edge.

10. A safety razor comprising, in combination, a pair of clamping members and a laminar blade having at least one longitudinal cutting edge clamped flatwise, between said members with only the cutting edge and an adjoining narrow margin exposed, the exposed portion of said blade being under longitudinal tension.

11. A safety razor comprising a thin tensionable blade, a pair of relatively movable clamping members adapted to clamp said blade between said members and means located and supported at least partly between said members and engaging said blade for automatically tensioning said blade lengthwise when said members are moved to blade-clamping position.

12. In a safety razor, a thin blade, clamping members for said blade, means on one of said members engaging the blade, means for drawing said members together into clamping position on the blade, means on said blade engaging means cooperating with said clamping members and blade whereby said blade may be placed under longitudinal tension simultaneously with the clamping of said blade by said members.

13. In a safety razor, a base, a clamping plate, a blade interposed and adapted to be clamped between said base and plate, and cooperating means between said base and plate for stretching said blade in the direction of its length.

14. In a safety razor, a blade, a pair of members between which the blade is clamped, and a resilient member between said first mentioned members for exerting a longitudinal tension on the blade.

15. In a safety razor, a base having a guard, a clamping plate, a blade interposed between said base and plate, a normally longitudinally curved member between said base and plate, and means carried by said member and cooperating with said blade for stretching the latter when the clamping plate is drawn towards the base.

16. A laminar razor blade of resilient metal of which a portion separated from the cutting edge by only a narrow margin is buckled relative to said edge, the margin being at least partially severed from the buckled portion, but being joined thereto near its ends.

17. A laminar razor blade of resilient metal of which a portion separated from the cutting edge by only a narrow margin is buckled relative to said edge, said margin being joined to the buckled portion near its ends, but being entirely severed

therefrom for a major portion of the distance from said joined part to near the center of its length.

18. A laminar razor blade of resilient metal of which a portion separated from the cutting edge by only a narrow margin is buckled relatively to said edge, the margin being joined to the buckled portion near its ends but being entirely severed from the buckled portion of the blades for a major portion of the distance from the joined part to near the center of its length.

19. A laminar blade adapted to be clamped in the holder of a safety razor, which comprises a narrow supporting margin of thin metal adjacent the edge so that a line within said margin which is equidistant from the edge, measured on the surface of the blade is parallel to the edge, and a body portion buckled so that a line within the body portion which is equidistant from the edge, measured on the surface, follows a path circuitous as compared with the edge, said body being adapted to be flattened when said blade is clamped in a holder, so that said last-named equidistant line is made to approach the form of the edge.

20. A laminar blade adapted to be clamped in the holder of a safety razor, which comprises a narrow supporting margin of thin metal adjacent the edge formed so that a line within said margin which is equidistant from the edge, measured on the surface of the blade, is parallel to the edge, and a body portion integrally connected to said margin substantially throughout its length and buckled so that a line within the body portion which is equidistant from the edge, measured on the surface, follows a path circuitous as compared with the edge, said body being adapted to be flattened when said blade is clamped in a holder, so that said last-named equidistant line is made to approach the form of the edge.

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